



COMPOSITE MATERIALS

Ferro Corporation, Cleveland, Ohio is a leading company in development and production of specialty materials for industrial customers. Among its products is a line of preimpregnated molding materials—or "prepregs"—manufactured by the Composites Division, which has facilities in Culver City, California and Norwalk, Connecticut. Prepregs are reinforced plastics, made by impregnating sheets of fibers—such as glass, graphite or quartz—with chemical compounds including polyimides, a class of plastics resistant to high temperatures. A sampling of Ferro prepregs, including materials in tape, filament and woven fabric form, is shown above. Some of the prepregs manufactured by the Composites Division are based on research conducted by Lewis Research Center on polyimide resins.

To improve certain characteristics of composite materials, which are finding increasing use in aircraft and other aerospace systems, Lewis developed an improved impregnating solution known as PMR-15. Interested in adding to its line of prepregs, Ferro Corporation obtained from Lewis the formula and the procedure for synthesizing PMR-15 and, after a period of company experimentation, used it in developing new composite materials. These Ferroreg® composites, compounded of polyimide/glass and polyimide/graphite, have a variety of applications, such as compressor blades for aircraft engines, radar domes, aircraft structures and other components requiring a material with high temperature resistance.

Ferro Corporation's customers include a number of major aerospace companies, among them The Boeing Company, General Dynamics Corporation, General Electric Company, McDonnell Douglas Corporation, Rockwell International Corporation and Hamilton Standard Division of United Technologies. The latter company is using a Ferro polyimide/graphite material



in jet engine nozzle flaps it is producing for the Pratt & Whitney Aircraft division of United Technologies; General Electric is also using Ferro prepregs in jet engines. Hamilton Standard used a Ferro composite in manufacture of 600 compressor blades for an Air Force supersonic wind tunnel at Arnold Engineering Development Center, Tullahoma, Tennessee; the four-foot blades (above) consist of fiberglass/polyimide shells bonded to steel and aluminum spars for operation at temperatures up to 550 degrees Fahrenheit.